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99th AVENUE CORRIDOR
IMPROVEMENT STAGING REPORT

SECTIONS 8-10, 15-17, 20-22, 27-29, 32-34
T2N, R1E, 3-5, T1N, R1E

MARICOPA COUNTY DEPARTMENT OF TRANSPORTATION

MARCH, 1998

Project Name: *99th Avenue Corridor Improvement Staging Report*

Project Termini: *I-10 to Glendale Avenue*

Requested by: *Maricopa County Department of Transportation*

PM_{10} Area? *Yes* **Corridor Length:** *8.05km (5 miles)*

Report Summary:

The analysis of the existing accident history, roadway alignment, and proposed Agua Fria freeway (Loop 101) construction revealed that improvements to 99th Avenue are warranted. One alternative proposes that the existing 4.9m (16 foot) wide Salt River Project Irrigation Channel adjacent to the west side of 99th Avenue be tiled and 99th Avenue e widened to provide three southbound travel lanes, a raised center median and three northbound lanes. Additional alternatives evaluate the costs associated with alignments offset east of the section line, with the same roadway cross-section. The projected traffic volumes reveal significant turning volumes in future years upon completion of the Agua Fria Freeway and construction of new developments within the 99th Avenue Corridor. In order to provide greater flexibility to accommodate future turning volumes it is recommended that all approaches to section line intersections be widened to provide dual left turn lanes. It is also recommended that provisions be established to obtain additional right-of-way on all approaches for future right turn lanes. Traffic projections indicate that an ultimate six lane facility may be warranted as development of undeveloped land in the corridor

occurs.

Additional "off-model" traffic volume projections have been conducted as part of this study based on a scenario in which densities approaching four houses per acre and major commercial centers are developed near the intersection of I-10 and Loop 101. This information indicates that an ultimate six lane section is anticipated to be warranted for 99th Avenue.
Because of the corridor reconstruction resulting from the presence of the Salt River Project (SRP) Channel, development and road improvements on the west side of Grand Avenue will be more difficult.

The projected traffic volumes reveal that a four lane section with a raised center median can be constructed as an interim improvement prior to year 2020 volumes. This interim improvement can be improved to a six-lane facility by year 2020.

The location of the US West facility in the project corridor constrains the roadway alignment alternatives north of Camelback Road. Relocation of this facility was determined to be cost prohibitive. A single alignment alternative was evaluated north of Camelback Road that includes piping the SRP irrigation channel between Camelback Road and the Bethany Home Road alignment.

The staging of improvements can be accomplished by providing an interim four lane roadway with or without a raised center median. The section of 99th Avenue between McDowell Road and Camelback Road would be the least costly section to improve (with the offset alignment). The section of 99th Avenue between Camelback Road and Glendale Avenue would include piping one mile of the SRP irrigation channel. A detail of the cost for each alignment alternative is discussed in Section 12 of this report.

As new development within the 99th Avenue Corridor is constructed, it is recommended that developers of frontage that abuts 99th Avenue assume the cost for widening 99th Avenue to the ultimate six lane urban facility.

A public meeting was held and participants supported an ultimate six lane facility on 99th Avenue. Many participants requested early improvements to enhance the safety of left and right turning vehicles prior to the full improvement of the project.

1.0 INTRODUCTION

1.1 Corridor Description

The section of 99th Avenue from Interstate 10 to Glendale Avenue is primarily a four lane, 5.2 mile north-south route connecting Interstate 10 with the southern interim terminus of Loop 101. North of Glendale Avenue, Loop 101 is a six lane, divided urban freeway which currently continues for approximately 16 miles until it connects to I-17.

Figure 1.1.1 shows the study corridor which lies within Maricopa County and the Metropolitan Phoenix area. The corridor passes through the cities of Phoenix, Avondale and Glendale. Both termini of this project area are under Arizona Department of Transportation (ADOT) jurisdiction.

Figure 1.1.1

Ninety Ninth Avenue is a major arterial with a 14.6m (48 foot) wide paved rural section, which does widen at the arterial intersections to provide left turn lanes. Land usage along the corridor is predominately agricultural with a few farm houses and small pockets of developed subdivisions. In addition, a half-mile length of 99th Avenue, from Campbell Avenue to Camelback Road, has been widened to provide a center two way left turn lane for a subdivision on the west side of 99th Avenue. The posted speed along this corridor is 50 miles per hour. Each section line roadway crossing along the corridor is currently signalized except at the Bethany Home Road alignment.

The Grand Canal is located within the 99th Avenue Corridor. This canal crosses 99th Avenue along the Bethany Home Road alignment. A major diversion structure is located at the canal on the west side of 99th Avenue. South of the diversion structure, a large diameter (1.98 m, 78") concrete pipe carries irrigation water a distance of 320 m (1050 ft.) to an open channel which parallels 99th Avenue south to McDowell Road.

1.2 Problem Statement

The existing roadway configuration, proximity of the road to the open channel, high traffic volumes on 99th Avenue, and speed of vehicles presents safety related deficiencies on 99th Avenue that may require mitigation. This report was prepared to evaluate the corridor and stage future improvements in the corridor. This study will also assist in providing direction to County and City staffs in working with private developers intending to develop private land within the corridor.

The Arizona Department of Transportation is intending to complete the Loop 101 from its southern terminus north of Glendale Avenue to Interstate 10 by December 2000. With the completion of the Loop 101, through traffic on 99th Avenue is anticipated to reroute to the newly constructed freeway, thus decreasing existing traffic volumes on 99th Avenue. As development along 99th Avenue occurs in future years, the traffic volumes will begin to increase.

1.3 Study Purpose

As mentioned in the Corridor Description, 99th Avenue functions as a interim connector route between the Agua Fria (Loop 101) Freeway and Interstate 10. Prior to 1997, the Loop 101 Freeway terminated at 75th Avenue on its northern terminus. During that time, Loop 101 Freeway, 99th Avenue and Interstate 10 route served as a viable alternative for residents of the Northwest Valley having destinations in the Central Phoenix area or the East Valley. With the connection of the Loop 101 Freeway to Interstate 17 in January of 1997, the volume of through traffic on 99th Avenue has increased. Portions of 99th Avenue are above the daily volume capacity for a four lane rural roadway (36,000).

This report will analyze roadway capacity with respect to future traffic volumes, and recommend interim and long term improvements. The development of the ultimate roadway section will also take into consideration the SRP Irrigation Channel, the existing roadway section, planned freeway construction and

accident history. The study will also provide a recommended interim section that will be compatible with the ultimate roadway section for 99th Avenue.

The ultimate roadway section for 91st Avenue has been established by the City's of Phoenix and Glendale as an urban five lane minor arterial road and a majority of this section has been completed in the study area. Traffic volumes are shown for 91st Avenue for information only. New improvement recommendations for 91st Avenue are included in this study.

2.0 EXISTING CONDITIONS

2.1 Overview

The existing conditions described for 99th Avenue are based on available records obtained from MCDOT files, traffic count data collected as part of this study and field observations. As-built plans, accident records and historic volume data were provided by MCDOT. Field observations were performed during daylight hours.

In the study area, 99th Avenue is an asphalt surfaced roadway, varying in width from 14.6m to 18.9m (48 feet to 62 feet), with a majority of the route being 14.6m (48 feet). Unpaved shoulders of at least 2.4m (eight feet) exist on most of the route. From I-10 to Glendale Avenue, 99th Avenue is primarily a four lane rural arterial roadway with four 3.6m (12 foot) travel lanes. The section line intersections with Glendale Avenue, Camelback Road, Indian School Road, Thomas Road and McDowell Road are signalized and separate left-turn lanes are provided for northbound, southbound, eastbound and westbound traffic. MCDOT Project #68854 added a continuous two-way left-turn lane on 99th Avenue south of Camelback Road to Campbell Avenue.

2.2 Roadway Alignment

The horizontal alignment of 99th Avenue from Glendale Avenue to I-10 is relatively straight. Two very minor curves exist just south of the Bethany Home Road alignment, adjacent to the Triple G Dairy Farm. The degree of curvature for both curves is 0^{o} 30' and they are separated by a 131.1m (430 foot) tangent section.

The vertical alignment closely follows a level natural grade line. The only noticeable change in vertical alignment occurs at the bridge crossing of the Grand Canal at the Bethany Home Road alignment adjacent to the Triple G Dairy Farm. At this location the vertical curves are 91.5m (300 feet) long and have a maximum roadway grade of 1.6%.

The existing cross slope (0.015'/ft) of the 99th Avenue pavement slopes to the east between McDowell Road and approximately 300m (1,000 ft.) south of the Bethany Home Road alignment. A normal two-way cross slope exists north of this location. A five lane section exists between Thomas Road and Glendale

Avenue. From McDowell Road to Thomas Road, there are two northbound lanes and one southbound lane.

2.3 Crossroads Intersecting 99th Avenue

As mentioned in the Overview above, there are several crossroads that intersect 99th Avenue. They are as follows:

McDowell Road

This is an east-west major arterial roadway under the jurisdiction of Maricopa County. It is a four lane undivided roadway on both sides of 99th Avenue. It widens at 99th Avenue to provide eastbound and westbound left turn lanes. McDowell Road continues to the east and west for several kilometers (miles) in each direction. The posted speed limit along McDowell Road east and west of 99th Avenue is 50 mph. McDowell Road is signalized at 91st and 99th Avenue intersections.

Thomas Road

Thomas Road is an east-west arterial roadway under the jurisdiction of Maricopa County. It is currently a two lane undivided roadway on either side of 99th Avenue; however, in cooperation with the County, the City of Phoenix is in the design stage of improvement plans to widen Thomas Road to a four lane divided facility. The road currently widens at 99th Avenue to provide left turn lanes for eastbound and westbound traffic. Thomas Road continues to the east through the Central Phoenix area. It currently terminates 3.2 kilometers (2 miles) west of 99th Avenue at the Agua Fria River. The City of Avondale has no current plans to extend Thomas Road across the Agua Fria River. The speed limit on Thomas Road is 50 mph east and west of 99th Avenue. McDowell Road is signalized at 91st and 99th Avenue intersections.

Indian School Road

This is a four lane undivided east-west arterial roadway under the jurisdiction of the City of Phoenix. Indian School Road widens at 99th Avenue to provide eastbound and westbound left turn lanes. Indian School Road extends to the west and east for several kilometers (miles) in each direction. The speed limit on Indian School Road is 50 mph east and west of 99th Avenue. Indian School Road is signalized at 91st and 99th Avenue intersections.

Camelback Road

Camelback Road is an east-west arterial roadway under the jurisdiction of the City of Phoenix west of 99th Avenue. The 99th Avenue intersection and east leg is under the jurisdiction of the City of Glendale. It is a four lane roadway east of 99th Avenue and a two lane roadway west of 99th Avenue. The west leg of the intersection widens to provide a left turn lane for eastbound traffic. Camelback Road continues for several kilometers (miles) both to the east and the west. The speed limit on Camelback Road is 45 mph east and west of 99th Avenue. Camelback Road is signalized at 91st and 99th Avenue intersections.

Glendale Avenue

This is an east-west arterial roadway under the jurisdiction of the City of Glendale. It is a four lane divided roadway east of 99th Avenue and a five lane undivided roadway west of 99th Avenue. Left turn lanes are provided for both eastbound and westbound traffic at 99th Avenue. The speed limit on Glendale Avenue is 45 mph east and west of 99th Avenue. Glendale Avenue is signalized at 91st and 99th Avenue intersections.

Glendale Avenue continues to the east through Central Phoenix. It currently extends to the west 6.4 kilometers (4 miles) where it terminates at Litchfield Road, which is the eastern boundary of the Luke Air Force Base. Glendale Avenue currently provides bike lanes on the north and south sides of the road east of 99th Avenue.

Campbell Avenue

This is an east-west two lane collector roadway located one half mile north of Indian School Road under the jurisdiction of the City of Phoenix. It has a developed pavement width of 6.7 meters (22 feet) west of 99th Avenue and an undeveloped dirt roadway on the east side. Curb and gutter and a pedestrian sidewalk currently exist on the north side of Campbell Avenue. In addition, there is a bridge crossing over the irrigation channel on the west leg of the Campbell Avenue/99th Avenue intersection. The posted speed limit on Campbell Avenue is 25 mph west of 99th Avenue and the intersection with 99th Avenue is stop controlled.

Meadowbrook Avenue

This is an east-west collector roadway located one quarter mile south of Camelback Road under the jurisdiction of the City of Phoenix. It has a roadway width of 8.5 meters (28 feet) with a four inch roll curb on the north and south sides of Meadowbrook Avenue. Meadowbrook Avenue is stop controlled at the intersection with 99th Avenue. A bridge crossing structure exists on Meadowbrook Avenue over the irrigation channel. The posted speed limit on Meadowbrook Avenue is 25 mph.

Rose Lane

Rose Lane is an undeveloped dirt road located one quarter mile north of the Bethany Home Road alignment and is under the jurisdiction of the City of Glendale. The dirt roadway is 7.9 meters (26 feet) wide and is bordered on the south by an open concrete ditch. Rose Lane provides access to residential homes located west of 99th Avenue. No traffic control signs currently exist on Rose Lane within the project study area.

The existing lane configurations for the 99th Avenue Corridor are shown in Figure 2.3.1.

Insert Figure 2.3.1

2.4 Existing Turn Lanes

Left-turn bays, which are typically 3.6m (12 feet) wide, exist for approaches to the Glendale Avenue, Camelback Road, Indian School Road, Thomas Road and McDowell Road intersections. An exclusive right-turn lane exists for northbound traffic at the McDowell Road intersection and on all approaches of the Glendale Avenue intersection. Maricopa County DOT Project #68854 added a continuous two-way left-turn lane south from Camelback Road to Campbell Avenue. The auxiliary lane storage lengths are provided in Table 2.4.1 for each intersection in the Corridor. The first number in the table is the available storage for each left turn lane including the opening, while the second number, if applicable, is the taper length creating the left turn lane.

TABLE 2.4.1
Existing Auxiliary Lane Lengths

Auxiliary Lanes	Northbound		Southbound		Eastbound		Westbound	
	LT Lane (ft) Length & Taper	RT Lane (ft) Length & Taper	LT Lane (ft) Length & Taper	RT Lane (ft) Length & Taper	LT Lane (ft) Length & Taper	RT Lane (ft) Length & Taper	LT Lane (ft) Length & Taper	RT Lane (ft) Length & Taper
McDowell Rd./99th Ave.	155-90	155-90	190-520	N/A	275-400	N/A	240-290	N/A
Thomas Rd./99th Ave.	235-305	N/A	225-430	N/A	230-315	N/A	200-330	N/A
Indian School Rd/99th Ave.	220-460	N/A	240-400	N/A	240-345	N/A	265-165	N/A
Camelback Rd./99th Ave.	245-LTL	N/A	245-450	N/A	285-LTL	N/A	255-200	N/A
Glendale Ave./99th Ave.	140-90	160-150	125-130	60-120	140-LTL	140-160	140-80	110-BL

LTL - Two way left turn lane.
BL - Bike lane.

2.5 Roadway Illumination and Delineation

Continuous roadway lighting is not provided along 99th Avenue within the project limits. The only lighting provided in the corridor is at the signalized intersections which have lighting provided by luminaries mounted on the signal poles. Roadside delineators on vertical poles are not present within the study corridor. However, raised pavement markers were recently installed as part of an overlay project.

2.6 Clear Zone

According to the MCDOT Roadway Design Manual, the clear zone width required for 99th Avenue is 9.1m (30 feet) measured from the edge of the travel lane if curb and gutter is not installed. The minimum clear zone width with vertical curb is 0.5 meters (1.5 feet) from the face of curb, with 0.9 meters (3 feet) of clearance desirable. A review of as-built plans and field observations revealed numerous objects within the clear zone including: irrigation canals and delivery structures, power poles, headwalls, fences, trees, sign posts, mailboxes, signal poles and concrete bridge rails.

2.7 Pedestrian/Bicycle/Equestrian Facilities

No facilities for pedestrians, bicycles or equestrians are provided in the study area, except for pedestrian indications and push buttons which are provided at all signalized intersections and a pedestrian walk on the west side of the 99th Avenue bridge at the Grand Canal. The corridor does not provide bicycle paths or lanes, sidewalks, or equestrian trails. A section of Glendale Avenue east of 99th Avenue provides bike lanes on the north and south sides of the road. A section of Campbell Avenue has a pedestrian sidewalk on the north side of the road near 99th Avenue.

2.8 Adjacent Land Use

The current primary land use in the 99th Avenue Corridor is agriculture; however, the majority of the land is zoned for residential use. The land east of 99th Avenue is zoned Rural-43 (1 d.u./acre) except for two commercial areas: the Indian School Road intersection is zoned C-3 (general commercial) and the land between McDowell Road and I-10 is zoned C-2 (community commercial). The Triple G Dairy Farm is currently located east of 99th Avenue at the Bethany Home Road alignment.

The land west of 99th Avenue from Glendale Avenue to Bethany Home Road and from Indian School Road to Thomas Road is zoned for agricultural use. The area from Bethany Home Road to Indian School Road is zoned for residential use except for commercial strips located on the southwest corner of the Camelback Road intersection and on the northwest corner of the Indian School Road intersection. Between Meadowbrook Avenue and Campbell Avenue, the Villa de Paz Master Planned Community is adjacent to the west side of 99th Avenue. The Holy Cross Cemetery is located on the southwest corner of 99th Avenue and Thomas Road. The west side of 99th Avenue from Thomas Road to I-10 is primarily zoned for single-family residential use and a Planned Area Development District.

2.9 Access Control

The Salt River Project (SRP) channel along 99th Avenue effectively limits access from the west except for constructed driveways that bridge the channel. For the rest of the corridor, there is no type of access control provided along 99th Avenue or the crossroads. Vehicles may enter or leave the roadway at any point within the study area. The lack of paved shoulders does not allow entering vehicles the opportunity

to accelerate prior to merging into the traffic flow.

2.10 Parking

Within the study corridor, there is no on-street parking currently provided. However, in most areas there is sufficient unpaved shoulder width to allow emergency parking within the clear zone. The posted speed limit of 50 mph and high travel speeds on 99th Avenue creates the potential for high speed rear-end accidents from parked vehicles entering 99th Avenue.

2.11 Driveways

There are numerous paved and unpaved private drives located along the study corridor. The existing roadway cross section allows vehicles to enter 99th Avenue at any location throughout the corridor and execute left turns to or from 99th Avenue. The posted speed limit of 50 mph on 99th Avenue provides the potential for high speed left turn and rear-end accidents.

2.12 Speed Zones

The posted speed limit within the study area is 50 miles per hour. The northern terminus of this project connects directly to Loop 101, which has a posted speed limit of 55 miles per hour. The east-west roads within the study area have the following posted speeds:

McDowell Road:	East of 99th Avenue =	50 mph
	West of 99th Avenue =	50 mph
Thomas Road:	East of 99th Avenue =	50 mph
	West of 99th Avenue =	50 mph
Indian School Road:	East of 99th Avenue =	50 mph
	West of 99th Avenue =	50 mph
Camelback Road:	East of 99th Avenue =	45 mph
	West of 99th Avenue =	45 mph
Glendale Avenue:	East of 99th Avenue =	45 mph
	West of 99th Avenue =	45 mph

2.13 Operating Speeds

Table 2.13.1 shows the average speed and 85th percentile speeds recorded at several locations within the

study area. These spot speed surveys were collected by MCDOT in March 1998 and February 1996. The 85th percentile speed is defined as the speed at or below which 85 percent of the motorists travel. The data collected in 1996 suggests an average speed of 54.9 mph and an 85th percentile speed of 59.3 mph. The data collected in 1998 suggests an average speed of 55.4 mph and an 85th percentile speed of 59.4 mph. A comparison of this data reveals that little change in speeds has occurred since 1996. The spot speed surveys and frequency distributions are included in the appendix.

TABLE 2.13.1
Spot Speed Summary

Location	Dir.	Date	Time	Avg. Speed (mph)	85th Percentile Speed (mph)
0.5 mile north of McDowell Rd.	Both	03-03-98	09:45-10:00 AM	55.0	59.4
0.5 mile north of Thomas Rd.	Both	03-03-98	10:05-10:20 AM	56.0	60.7
0.5 mile north of Indian School	Both	03-03-98	10:25-10:40 AM	54.3	57.6
0.5 mile north of Camelback Rd.	Both	03-03-98	10:45-11:00 AM	56.0	59.6
0.5 mile south of Glendale Ave	Both	03-03-98	11:05-11:20 AM	55.5	59.7
			1998 Average	**55.4**	**59.4**
AM Peak Hour					
1 mile north of Camelback Rd.	SB	2-8-96	7:10-7:33 AM	50.6	53.9
1 mile north of Camelback Rd.	NB	2-8-96	7:35-7:45 AM	51.8	56.1
0.5 mile south of Indian School	SB	2-8-96	7:50-8:07 AM	56.3	61.3
	NB	2-8-96	8:10-8:24 AM	58.5	52.9
PM Peak Hour					
1 mile north of Camelback Rd.	SB	2-7-96	4:15-4:30 PM	53.4	58.6
	NB	2-7-96	4:35-4:50 PM	54.8	59.1
0.5 mile south of Indian School	SB	2-7-96	5:15-5:30 PM	56.1	61.4
	NB	2-7-96	4:55-5:10 PM	57.9	61.9
Off-Peak					
1 mile north of Camelback Rd.	NB	2-7-96	3:00-3:15 PM	53.1	57.6
	SB	2-7-96	3:20-3:35 PM	53.9	58.7
0.5 mile south of Indian School	NB	2-7-96	2:10-2:30 PM	57.0	62.5
	SB	2-7-96	2:35-2:50 PM	55.0	59.8
			1996 Average	**54.9**	**59.3**

Note: The posted speed limit on 99th Avenue is 50 mph.

2.14 Traffic Volumes

Traffic volume counts were obtained from MCDOT for the years 1994, 1995, and 1996 and are summarized in Table 2.14.1. KM measured daily traffic volumes in May 1997, which are also in Table 2.14.1 and summarized in Figure 2.14.1. The 1997 average two-way daily volume on 99th Avenue, within the study area, is approximately 33,370 vehicles per day.

insert Figure 2.14.1

Table 2.14.1
99th Avenue Daily Traffic Volumes

Section	1994	1995	1996	1997
Glendale Ave. to Bethany Home Rd.	28,217	28,184	26,043	39,136+
Bethany Home Rd. to Camelback Rd.	28,712	27,782	36,463	39,136+
Camelback Rd. to Indian School Rd.	21,511	24,005	24,323	34,792
Indian School Rd. to Thomas Rd.	23,065	20,799	31,502	31,151
Thomas Rd. to McDowell Rd.	13,309	12,312	28,825	28,407
AVERAGE	22,963	22,616	29,431	33,370#

\+ Only one count recorded between Camelback Road and Glendale Avenue. Volume used for both segments.
\# Average based on four volumes only.

Peak hour turning movement counts were obtained at the McDowell Road, Thomas Road, Indian School Road, Camelback Road and Glendale Avenue intersections in May 1997. The results of these counts are shown in Figures 2.14.2 and 2.14.3. Queue surveys were also taken at these locations in order to determine the number of vehicles in the left-turn queue on each leg of the intersection. The queue volumes are summarized in Figure 2.14.4.

2.15 Historical, Current and Programmed Improvements

A list of the historical, current and programmed corridor improvements has been compiled. These improvements include:

- MCDOT project number 68854 was completed in September, 1994. This project added a continuous two-way left-turn lane from Campbell Avenue to Camelback Road.
- Protected/permissive left-turn phasing at the Indian School Road intersection was implemented on August 25, 1994.
- In the 1993-94 fiscal year, a pavement overlay was done on 99th Avenue that included the addition of raised pavement markers.
- Wireless signal coordination (spread spectrum) was recently installed on 99th Avenue to provide better progression for through traffic between McDowell Road and Indian School Road.
- Similar installation is being considered between Camelback Road and Glendale Avenue by the City of Glendale.
- The City of Phoenix and Maricopa County are involved in a joint project to widen Thomas Road to four lanes from 91st Avenue to 99th Avenue.
- The Arizona DOT is planning to construct the remaining portion of the Loop 101 Freeway, between Interstate 10 and Glendale Avenue. The scheduled completion date is December 2000.

Figure 2.14.2

Figure 2.14.3

Fig 2.14.4

3.0 EXISTING TRAFFIC ANALYSIS

3.1 Intersection Level of Service

The peak hour volumes shown in Figures 2.14.2 and 2.14.3 were analyzed at signalized intersections using the lane configurations shown in Figure 2.3.1 and the capacity information provided in the 1994 Highway Capacity Manual (HCM) for signalized intersection levels of service. The resulting levels of service (LOS) are shown in Table 3.2.1. Intersection timing data was based on existing signal timing at each intersection provided by MCDOT and the City of Glendale. The analysis sheets and timing sheets are provided in the Appendix.

TABLE 3.1.1
1997 Peak Hour Levels of Service

Intersection	Peak Hour	
	AM	**PM**
99th Ave./McDowell Rd.	B	F
99th Ave./Thomas Rd.	B	B
99th Ave./Indian School Rd.	D	F
99th Ave./Camelback Rd.	B	F
99th Ave./Glendale Ave.	F	F

3.2 Roadway Capacity

The daily roadway volumes shown in Figure 2.14.1 were compared to volumes shown in Table 2.1 of the MCDOT Roadway Design Manual. The ADT capacity was based on the existing classification of 99th Avenue as an Urban Principal Arterial roadway. The resulting comparison is shown in Table 3.2.1.

The study area section of 99th Avenue from McDowell Road to Glendale Avenue is shown to be currently operating above design capacity. The corresponding level-of-service analysis revealed that the section of 99th Avenue between Camelback Road and Glendale Avenue is currently at the roadway capacity threshold volume.

TABLE 3.2.1
Existing Roadway Capacity

Roadway Segment	No. of Lanes	ADT Capacity	ADT Volume	Comparison	Level-of-Service
99th Ave.- McDowell Rd. to Thomas Rd.	4	22,000*	28,410	OVER	C
99th Ave. - Thomas Rd. to Indian School Rd.	4	22,000*	31,150	OVER	C
99th Ave. - Indian School Rd. to Camelback Rd.	4	22,000*	34,800	OVER	D
99th Ave. - Camelback Rd. to Glendale Ave.	4	22,000*	39,140	OVER	E
McDowell Rd. - 91st Ave. to 99th Ave.	4	22,000	3,970	UNDER	A
Thomas Rd. - 91st Ave. to 99th Ave.	2	7,000	6,280	UNDER	B
Indian School Rd. - 91st Ave. to 99th Ave.	4	22,000	13,000	UNDER	A
Camelback Rd. - 91st Ave. to 99th Ave.	4	22,000	11,260	UNDER	A
Glendale Ave. - 91st Ave. to 99th Ave.	4	22,000	11,580	UNDER	A

* Based on urban roadway cross-section - Table 2.1 MCDOT Roadway Design Manual

3.3 Left Turn Storage Length Analysis

The peak hour volumes shown in Figures 2.14.2 and 2.14.3 were used to calculate the existing required storage length for each left turn lane.

An analysis of the storage lengths provided for left turn lanes was conducted for 99th Avenue based on projected turning volumes and existing storage lane lengths. The storage lengths required were calculated per MCDOT guidelines. Maricopa County DOT guidelines specify that the queue length is calculated per the following criteria:

Vehicles per cycle = 2 * vehicles per hour/cycles per hour
queue length = vehicles per cycle * 25 feet
with a 120 sec. cycle length, 30 cycles per hour occur

Queue Length = 2 * vehicles per hour * 25 feet/30 cycles per hour

The queue length was also evaluated using chapter 9 of the Highway Capacity Manual, 1994 edition. Table 3.3.1 provides the results of the calculations, while also comparing the existing queue to the available storage length.

TABLE 3.3.1
1997 Peak Hour Storage Length Analysis

Intersection	Aux. Lanes	PHV	# of Vehicles	Length (ft.) (Req.)	Length (ft.) (Avail.)	Comparison	(HCM) Synchro (ft.)
McDowell Rd./	NB Left	163	5	125	155		344#
99th Ave.	SB Left	181	6	150	190		389#
(cycle length = 57 sec.)	EB Left	98	3	75	275		179#
	WB Left	11	1	25	240		13
Thomas Rd./	NB Left	52	2	50	235		34
99th Ave.	SB Left	109	4	100	225		285#
(cycle length = 66 sec.)	EB Left	22	1	25	230		31
	WB Left	9	1	25	200		16
Indian School Rd./	NB Left	60	3	75	220		40
99th Ave.	SB Left	103	6	150	240		59
(cycle length = 94 sec.)	EB Left	142	8	200	240		146
	WB Left	13	1	25	265		25
Camelback Rd./	NB Left	45	3	75	245		167#
99th Ave.	SB Left	134	7	175	245		467#
(cycle length = 97 sec.)	EB Left	144	8	200	285		397#
	WB Left	63	4	100	255		90
Glendale Ave./	NB Left	32	4	100	140		34
99th Ave.	SB Left	180	23	575	125	Over	481#
(cycle length = 220	EB Left	375	47	1175	140	Over	874#
sec.)	WB Left	42	5	125	140		94

- 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles.
Note: Cycle length at Glendale Avenue/99th Avenue intersection is based on field investigation by the City of Glendale staff to reduce south bound traffic from queuing into freeway.

As shown in Table 3.3.1, the approaches at the Glendale Avenue/99th Avenue intersection may currently have insufficient storage lengths for left turning vehicles. The Highway Capacity Analysis revealed that insufficient storage lengths may exist at McDowell Road, Thomas Road, Camelback Road, and Glendale Avenue intersections with 99th Avenue.

4.0 ACCIDENT ANALYSIS

Accident data was provided by MCDOT for analysis of the 99th Avenue Corridor. Accident records from the State Accident data bank were summarized and are contained in the Appendix for the years 1994 through 1996. They include accidents reported by different reporting agencies (i.e., Sheriff's Department, Department of Public Safety, City Police). Accident records were also provided by MCDOT and City of Glendale from the records for 99th Avenue and 91st Avenue between McDowell Road and Glendale Avenue from 1994 to 1996. The following is a summary of the 99th Avenue accident data from 1994 to 1996.

TABLE 4.0.1
99th Avenue Accident Summary

Description	Number	Percent
Total Accidents	394	100%
Intersection Accidents	220	56%
Mid-Block Accidents	174	44%
Left-Turn Accidents	66	17%
Rear-End Accidents	177	45%
Property Damage Only	202	51%
Injury	182	46%
Fatality	8	2%
Unknown	2	1%
Daytime Accidents	270	69%
Nighttime Accidents	92	23%
Dawn/Dusk Accidents	32	8%

The number of accidents that were recorded at the study intersections was analyzed using information from the Institute of Transportation Engineers (ITE) *Traffic Engineering Handbook*, 4th Ed. The accident rate of an intersection can be calculated by the following equation:

$$\text{Intersection Accident Rate} = \frac{\text{Annual Number of Accidents} \times 10^6}{\text{Annual Traffic Entering the Intersection}}$$

Where Rate = Accidents per Million Vehicles Entering the Intersection Annually (MEV)

Using the equation above, the accident rate for each intersection was calculated for a three year history. The accident rates were calculated for intersections and roadway links between McDowell Road and Glendale Avenue on 99th Avenue. These accident rates are shown in Table 4.0.2.

An analysis of the accident rates and summary information revealed the following information:

99th Avenue (3 year accident history)
- 99th Avenue section line intersections have an average accident rate of 1.18 from McDowell Road to Glendale Avenue. This is 2.1 times higher than the County accident average of 0.55 for signalized intersections.
- Left turn accidents account for 17% of total accidents on 99th Avenue.
- Rear end accidents account for 45% of total accidents on 99th Avenue.
- Fatality accidents occur in 2% of total accidents.
- 89% of accidents involved other motor vehicles.

The predominant accident is a rear-end collision. This accident is a result of the high volume of through traffic traveling between two high speed facilities (Loop 101 and I-10). Upon completion of the Loop 101 extension to I-10, the heavy through traffic volumes are anticipated to shift to the new freeway section. Traffic on 99th Avenue is projected to be local access traffic after completion of the freeway extension. The construction of a raised center median and widening of 99th Avenue is anticipated to provide a more urban setting for traffic volumes and slow through traffic. The median construction and new freeway construction are planned to significantly reduce the high accident frequency on 99th Avenue.

The insufficient storage length for southbound left turning vehicles at the 99th Avenue/Glendale Avenue intersection is anticipated to contribute to the high accident frequency at this intersection. **Reconstruction of this southbound left turn lane is recommended to be completed as part of the no-build alternative.** Ultimate improvements to this intersection would include the construction of dual left turn lanes on each approach.

TABLE 4.0.2

5.0 UTILITY INFORMATION

Existing utility information was researched and utility companies were contacted through Bluestake Utility Service. Record Drawings for 99th Avenue were researched and field visits were conducted to identify utilities within or adjacent to the existing rights-of-way. Table 5.0.1 details the existing utility information obtained from this research.

Table 5.0.1
Existing Utility Information

		Metric		English	
Utility	Location	Quantity	Units	Quantity	Units
99th Avenue, I-10 to McDowell Road					
Traffic Signal Poles	Four Corners of Intersection			8	EA.
6' Concrete Irrigation Ditch	40' West of 99th Ave. Centerline			600	L.F.
12 kv Overhead Electrical Lines	40' West of 99th Ave. Centerline			5	Poles
66" Sanitary Sewer	Within Existing SB Lanes			700	L.F.
Concrete Irrigation Structure	65' West of 99th Ave. Centerline			1	EA.
Signal Box (above ground)	35' East of 99th Ave. Centerline			1	EA.
SRVWUA 42" RGRCP	40' West of 99th Ave. Centerline			700	L.F.
12" ACP	40' West of 99th Ave. Centerline			750	L.F.
84" RGRCP-Canal	Beneath McDowell Rd. to Conc. Irrig. Struct.			100	L.F.
24" Conc. Pipe	Extends from conc. structure E. of 99th Ave.			120	L.F.
18" Conc. Pipe	Extends E. of Conc. Struct. East of 99th Ave.			100	L.F.
12 kv Overhead Electrical Lines	40' South of McDowell Rd. Centerline			300	L.F.
99th Avenue, North of McDowell Road to Thomas Road					
Open Concrete Lined 16' Ditch	45' West of 99th Ave. Centerline			0.85	mi.
78" Pipe Culvert	45' West of 99th Ave. Centerline			450	L.F.
16" Waterline	65' West of 99th Ave. Centerline			0.2	mi.
City of Avondale Well Site	80' West of 99th Ave. Centerline			1	EA.
66" Sewer line	Within SB 99th Ave. Asphalt			0.2	mi.
60" Sewer line	Within SB 99th Ave. Asphalt			0.8	mi.
12 kV Overhead Electrical Line	55' West of 99th Ave. Centerline			6	Poles
12 kV Overhead Electrical Line	40' West of 99th Ave. Centerline			0.85	mi.
Concrete Headwall w/Trash Rack	45' West of 99th Ave. Centerline			1	EA.
Canal Crossing 99th Ave.	0.2 miles North of McDowell Rd.			1	EA.
36" Culvert	35' East of 99th Ave. Centerline			0.5	mi.
Concrete Bridge	30' West of 99th Ave. CL, Over Canal			2	EA.
72" RGRCP @ Cemetery D/W	30' West of 99th Ave. Centerline			65	L.F.
Conc. Lined Ditch N&S of Thomas Rd.	35' S & 55' N of Thomas-extends E of 99th Ave			2	EA.
18" Storm Drain	55' East of 99th Ave.			110	L.F.
36" Storm Drain	60' East of 99th Ave.			120	L.F.

6" Petroleum Gas Line	25' South of Thomas Rd. (E/W)			120	L.F.

Table 5.0.1 (cont.)
Existing Utility Information

		Metric		English	
Utility	Location	Quantity	Units	Quantity	Units
99th Avenue, North of McDowell Road to Thomas Road (cont.)					
18" Sewer Line	10' South of Thomas Rd. Centerline			100	L.F.
SRP Well Site	70' East of 99th Ave. Centerline			1	EA.
Catch Basins	NE, NW & SE Corners of Thomas Rd Intersect.			3	EA.
Traffic Signal Poles	Four Corners of Intersection			8	EA.
Concrete Headwall	60' East of 99th Avenue Centerline			2	EA.
Concrete Headwall	40' West of 99th Avenue Centerline			2	EA.
99th Avenue - North of Thomas Road to Indian School Road					
30" Pipe Culvert	50' East of 99th Ave. Centerline			750	L.F.
60" Sewer Line	Within SB 99th Ave. Asphalt			1	mi.
Open Conc. Lined 16' Ditch	50' West of 99th Ave. Centerline			1	mi.
Conc. Headwall w/Trash Rack	50' East of 99th Ave. Centerline			1	EA.
30" RCP, (beneath 99th Ave.)	30' South of Indian School Rd. CL (e/w)			160	L.F.
Wooden Bridge Over 16' Canal	35' West of 99th Ave. Centerline			1	EA.
Conc. Lined Irrig. Ditch	45' East of 99th Ave. Centerline			0.6	mi.
15" Concrete Pipe	50' North of Indian School Rd. Centerline			80	L.F.
18" RGRCP	45' East of 99th Ave. Centerline			100	L.F.
12" Waterline	Within Indian School Rd. Asphalt (e/w)			120	L.F.
18" Sewer line	Within Indian School Rd. Asphalt (e/w)			90	L.F.
12" Sewer line	Within Indian School Rd. Asphalt (e/w)			120	L.F.
12 kV Overhead Electrical Line	20' North of Indian School Rd. Centerline			3	Poles
SRP Well Site	65 ' West of 99th Ave. Centerline			1	EA.
Traffic Signal Poles	Four Corners of Intersection			8	EA.
Canal Conc. Irrig. Struct.	40' West of 99th Ave. Centerline			1	EA.
Conc. Lined Ditch	80' West of 99th Ave. Centerline			1	mi.
Communications Line (telephone)	Within EB Indian School Rd. Asphalt			120	L.F.
99th Avenue, North of Indian School Road to Camelback Road					
12 kV Overhead Electrical Line	65' West of 99th Avenue			1	mi.
18" RGRCP	45' East of 99th Ave. Centerline			150	L.F.
54" Sewer line	Within SB 99th Ave. Asphalt			1	mi.
Open Conc. Lined 16' Ditch	45' West of 99th Ave. Centerline			1	mi.
Telephone Cable (buried 4" PVC)	65' West of 99th Ave. Centerline			1	mi.
Conc. Headwall w/Grate	50' East of 99th Ave. Centerline			1	EA.
Earth Tailwater Ditch	40' East of 99th Ave. Centerline			0.5	mi.

Bridge over 16' Ditch	40' West of 99th Ave. Centerline	1	EA.
24" RGRCP	40' W. of 99th Ave. CL/ beneath 99th Ave.	150	L.F.

Table 5.0.1 (cont.)
Existing Utility Information

Utility	Location	Metric Quantity	Metric Units	English Quantity	English Units
99th Avenue, North of Indian School Road to Camelback Road (cont.)					
Headwall w/Trash Rack	40' East of 99th Ave. Centerline			1	EA.
Irrigation Junction Box (4'x4')	40' East of 99th Ave. Centerline			1	EA.
Conc. Lined Irrig. Ditch	45' West of 99th Ave. Centerline			0.25	mi.
Traffic Signal Poles	Four Corners of Intersection			8	EA.
Canal Conc. Irrig. Struct.	85' West of 99th Ave. Centerline			1	EA.
Cable TV Junction Box	65' West of 99th Ave. Centerline			1	EA.
12" RGRCP	Beneath Camelback Road (e/w)			100	L.F.
24" RGRCP	Beneath 99th Ave. & Camelback Rd.			270	L.F.
Conc. Headwall w/Trash Grate for 12" & 24" RGRCP	50' East of 99th Ave. Centerline			2	EA.
Conc. Headwall for 16' Conc. Ditch	90' West of 99th Ave. Centerline			2	EA.
48" Sewer	Within Camelback Rd., EB Lanes			100	L.F.
12" Waterline	Within Camelback Rd., EB Lanes			100	L.F.
2" Waterline	Within Camelback Rd., EB Lanes			150	L.F.
4" PVC Telephone Line	Within Camelback Rd., EB Lanes			150	L.F.
Open Conc. Lined Ditch	50' South of Camelback Rd. Centerline			50	L.F.
12 kV Overhead Electrical Line	45' North of Camelback Rd. Centerline			2	Poles
North of Camelback Road to Bethany Home Road					
Well Site	60' West of 99th Ave. Centerline			1	EA.
2" Waterline	Within SB 99th Ave.			1	mi.
12" Waterline	Within SB 99th Ave.			1	mi.
4" PVC Telephone Line	Within SB 99th Ave.			2	mi.
Earth Tailwater Ditch	45' East of 99th Ave. Centerline			0.45	mi.
54" Sewer Line	20' West of 99th Ave. Centerline			0.5	mi.
21" RGRCP	45' East of 99th Ave. Centerline			420	L.F.
Conc. Headwall	45' East of 99th Ave. Centerline			2	EA.
42" Sewer Line	20' West of 99th Ave. Centerline			1	mi.
Open Conc. 16' Ditch	35' West of 99th Ave. Centerline			0.76	mi.
12" RGRCP	40' East of 99th Ave. Centerline			200	L.F.
Conc. Lined Ditch	60' West of 99th Ave. Centerline			130	L.F.
Conc. Lined Ditch	85' West of 99th Ave. Centerline			230	L.F.
84" C.I.P.P.	60' West of 99th Ave. Centerline			1040	L.F.
Conc. Headwall for 16' Ditch	60' West of 99th Ave. Centerline			1	EA.

Canal Crossing 99th Ave.	At Bethany Home Rd. Alignment	1 EA.

Table 5.0.1 (cont.)
Existing Utility Information

Utility	Location	Metric		English	
		Quantity	Units	Quantity	Units
99th Avenue, North of Bethany Home Road to Glendale Avenue					
6" Waterline	17' West of 99th Ave. Centerline			1	mi.
12" Waterline	15' East of 99th Ave. Centerline			1	mi.
2" Waterline	19' East of 99th Ave. Centerline			1	mi.
42" Sewer	10' West of Centerline			1	mi.
4" PVC Telephone Line	47' W., 30' E. & 20' E. of 99th Ave. CL			3	mi.
Conc. Lined Ditch	40' West of 99th Ave.			0.4	mi.
RWCD Well Site	60' East of 99th Ave.			1	EA
12 kV Overhead Electrical Line	55' East of 99th Ave.			1	mi.
12 kV Overhead Electrical Line	40' North of Glendale Ave.			2	Poles
RWCD Conc. Lined Ditch	40' East of 99th Ave. Centerline			0.4	mi.
Concrete Headwall	40' East of 99th Ave. Centerline			5	EA.
12 kV Overhead Electrical Line	40' N. & 40' S. of Glendale Ave. Centerline			4	Poles
Traffic Signal Poles	Four Corners of Intersection			4	EA.
6" Fire Hydrant	55' East of 99th Ave.			1	EA.
Conc. Irrig. Struct.	60' West of 99th Ave.			2	EA.

6.0 ENVIRONMENTAL OVERVIEW

The following is a summary of the Environmental Overview prepared as a separate document to the Corridor Study.

6.1 Socio-Economic Environment

This is a summary identifying the socio-economic resources within the project area using the Arizona Department of Economic Security (ADES) 1990 census data and Arizona Department of Commerce (ADC) *Community Profile Sheets.* Table 6.1.1 provides the racial demographics for the 99th Avenue project area (1990), while Table 6.1.2 provides a summary of the 1990 socio-economics for the area.

TABLE 6.1.1
Racial Demographics for the 99th Avenue Project Area - 1990

Area	White	African American	Native American	Asian	Other	Hispanic*
Block Group Totals	82%	3%	6%	1%	8%	28%
Maricopa County	84%	4%	2%	2%	8%	16%

* As indicated in census as a part of generic white demographic group.
Note: Totals exceed 100% because some people are classified in more than one category.

TABLE 6.1.2
Summary of Socio-Economics - 1990

Area	Protected Minority	Elderly	Low Income	Mobility Disability	Female Household (%)
Block Group Totals	46%	4.5%	8.5%	3%	3.4%
Maricopa County	16%	13%	12%	5%	3%

Table 6.1.2 indicates that protected minorities have a population percentage greater than that for Maricopa County; however, the 1990 census data for the project area indicates that any future roadway improvement projects along 99th Avenue will not have any proportionately high or adverse effects on these identified populations.

6.2 Physical and Natural Environment

The following agencies were contacted regarding their responsibility within the project area:

Department of Environmental Quality (ADEQ), Arizona Department of Transportation (ADOT), Arizona Game & Fish Department (AGFD), Arizona State Museum (ASM), Arizona State Land Department (ASLD), State Historic Preservation Office (SHPO), US Fish and Wildlife Service (USFWS), and the Natural Resources Conservation Service (NRCS).

The following is a summary of the information received:

- The entire study area is relatively flat and composed of deep alluvial and colluvial soils.
- Wildlife inhabitants include: The Morning Dove, Gambles's Quail, Cactus Wren, Western Shovelnose Snake and the Zebra-tailed Lizard.
- No endangered, threatened or candidate species exist within the study area, nor are there any critical habitats areas within the Corridor.
- There are no sole source aquifers, unique waters or wetlands within the project area.

- The 99th Avenue Corridor is within the Maricopa County Non-attainment Area. The national standard for Particulate Matter (P_{10}) is exceeded.
- Two underground storage tanks (UST) were identified at the Triple G Dairy, while two leaking underground storage tanks (LUST) were noted at the Triple G Dairy.

6.3 Cultural Resources

Cultural resource considerations within the project corridor were identified from information gathered from Arizona State Museum (ASM), State Historic Preservation Office (SHPO), and existing environmental studies relevant to the project area. Based on these sources, no previously identified historic properties are located within the project area.

7.0 DRAINAGE INFORMATION

The drainage area contributing to the east side of 99th Avenue, between McDowell Road and Glendale Avenue, is in cultivation and slopes northeast to southwest at an average of 0.30%. The land has been leveled and original drainage paths have long been obliterated by agricultural practices. This area is also undergoing the next land use step of increasing development which will reduce runoff to 99th Avenue. A pattern of irrigation supply and tailwater canals now serve as drainage flow paths. The canals beneficially serve to intercept storm runoff from the east, but present an unexpected hazard in that they are potentially subject to overtopping or breaching during rare storm events, sending sudden significant discharges towards 99th Avenue. The existing road is a paved four lane rural section, one-way crowned from Bethany Home Road to McDowell Road, that sheds runoff into adjacent fields and ditches.

99th Avenue is part of the current Maryville Study (ADMS) being conducted by the Flood Control District. Post freeway conditions are not a part of the current scope. A small portion of the right-of-way lies in a Federal Emergency Management Agency (FEMA) 100-year floodplain, Zone A, at the location where the roadway intersects the Roosevelt Irrigation District Canal. Ponding areas along the north side of the Canal were mapped under the Flood Insurance Study (1990). (See Appendix.)

Cross drainage is not a predominant existing feature along this project's limits, but ADOT is planning a diversion canal from the proposed Agua Fria Freeway to the New River, just north of the Grand Canal at the Bethany Home Road crossing. The cross section is planned to be a 22 meter (72 foot) wide trapezoidal channel with 2:1 side slopes. It will be located adjacent to the north edge of the existing SRP right-of-way for the Grand Canal. Arizona D.O.T. plans a bridge on 99th Avenue over the diversion channel. The channel will be 2.4 meters (8 feet) deep to clear a sanitary sewer in 99th Avenue.

99th Avenue will be protected from excessive runoff by the proposed Agua Fria Freeway, which will be constructed by the year 2001 and run parallel to 99th Avenue 0.8 kilometers (one-half mile) further east. The freeway will effectively intercept off-site runoff from the much larger watershed that lies to the east. The remaining drainage area contributing to 99th Avenue in this portion is characterized by level farm fields

were storm runoff drains slowly off the cultivated fields, finding its way to the low corner of the field where it is drained by smaller diameter pipes or builds up sufficiently to overtop the road and flow into a road ditch, tailwater ditch or into the next field. A series of cultivated sections of land will take days to bleed off a major storm event because of the substantial field storage and infiltration. In this case, those agricultural sections of land lying east of 99th Avenue require a more sophisticated hydrologic analysis than could be achieved within the scope of this project.

Possible storm water outfalls would be the proposed diversion channel at Bethany Home Road and the open channel along the north side of I-10. Permission from ADOT would be needed to discharge concentrated flows at either location. The average slope from north to south along 99th Avenue is 0.23%. Another possible outfall is the Agua Fria River lying from 3.2 to 6.4 kilometers (2 to 4 miles) west of the 99th Avenue Corridor.

One drainage design alternative was considered for 99th Avenue. The alternative would utilize roadside ditches to convey storm water to retention areas parallel to the roadway and within roadway right-of-way. The retention areas would be drained either by drywells, infiltration or metered into ADOT channels. Calculations related to the amount of 10-year, 25-year and 100-year, 2-hour storm retention volumes required are included in the Appendix..

It is anticipated that the outside through lane of the ultimate improvement will be constructed as the adjoining properties are developed. At that time the retention areas may be combined into those needed by private development or storm drains constructed allowing the property along 99th Avenue to be used for development purposes.

8.0 TRAFFIC PROJECTIONS

8.1 Future Traffic Volumes

Future traffic volumes for 99th Avenue were provided by MCDOT. The projections by MCDOT are based on the Maricopa Association of Governments (MAG) updated socio-economic data for Maricopa County. These future year daily projections were provided for 2001, 2010 and 2020.

Peak hour turning volumes were calculated based on these projected daily volumes. Peak to daily factors (K values) of 0.08 and 0.10 were used for AM and PM peak hours, respectively. The approach volumes were assigned to turning or through movements based on a balance of approach and departure volumes. The percentage distribution calculation sheets used for this effort are contained in the Appendix. The 2001, 2010 and 2020 peak hour (AM and PM) volumes are shown in Figures 8.1.1-3. The 2001, 2010 and 2020 projected daily volumes are shown in Figures 8.1.4-6.

Projected traffic volumes reveal that the predominant volume currently on 99th Avenue is through traffic that will divert to the newly constructed freeway by year 2001. Traffic volumes are shown to drop significantly on 99th Avenue upon completion of this new freeway connection between the Agua Fria Freeway and Interstate 10.

Long term (2020) traffic projections reveal that as development in the agricultural areas surrounding 99th Avenue occurs, traffic volumes will steadily increase from the previously reduced volume. This increase in traffic; however, will have different travel patters than existing volumes. This projected traffic is anticipated to have origins or destinations within the study area rather than be a predominately through maneuver. Future volumes are likely to have much higher turning movement volumes at major intersections. These high turning movement volumes are likely to warrant dual left turn lanes and right turn lanes at major intersections.

Figure 8.1.1

Figure 8.1.2

Fig 8.1.3

Fig 8.1.4

Fig 8.1.5

Fig 8.1.6

8.2 Updated MAG Model Forecast

Year 2020 development rates for the 99th Avenue corridor were evaluated to determine if densities were appropriate for the study area. An update of these development rates was conducted. The methodology used to produce the new socioeconomic forecasted variables used to forecast traffic for the 99th Avenue Corridor is as follows.

The traffic forecasting scenarios for the 99th Avenue Corridor project were developed using the socioeconomic control totals prepared by MAG in the spring of 1997. However, a scenario for a possible new housing and commercial development was identified during the project. Since the development was not already included in the MAG 2015 socioeconomic projections, a new socioeconomic scenario was devised to test the possible impact of the development in the corridor.

The proposed development is situated between 91st Avenue, 99th Avenue, Thomas Road, and Campbell Avenue. The development would primarily contain single family housing, some multifamily housing, a school with a park, a golf course, commercial and shopping areas. A preliminary phasing plan was obtained for the development. The proposed development plan did not recognize the right-of-way for the Agua Fria Freeway from I-10 to Glendale Avenue. Hence, the acres for the right-of-way were deducted from the total development acres. For this, 4.5 acres were deducted for each freeway mile from the total available land that can be developed to account for the freeway right-of-way.

New buildout control totals were calculated for both residential and commercial acreage. The resulting average number of housing units per acre was 4.62 for single family dwellings, and 13.6 for multifamily dwellings in the development area. The new housing totals were then allocated to the respective Traffic Analysis Zones (TAZs).

Similarly, an employee per acre rate was computed for the new development and converted to number of employees. The employment control total was redistributed among the various employment types. This task was accomplished using the ratio of number of employees for each employment type to total number of employees for the respective employment type originally developed by MAG for the TAZs. The new household and employment figures were then added to the already existing MAG forecasted totals for the area.

To account for growth in the surrounding areas in response to the new development, an adjustment was also made to the socioeconomic forecast in these areas. The rate of 4.62 dwelling units per acre was applied in forecasting the new number of households, as well as the new rate of employees for each employment category for the developable acreage in the surrounding areas. The original socioeconomic forecast was retained if the new rates resulted in a lower forecast than the original forecast. Table 8.2.1 summarizes the original forecasted socioeconomic variables, while Table 8.2.2 summarizes the new forecasted socioeconomic variables by TAZ for the 99th Avenue Corridor area. Figure 8.2.1 graphically depicts the updated daily traffic volumes.

insert Figure 8.2.1

Table 8.2.1
Original 2015 Socioeconomic Variables by TAZ

TAZ	Pop	DUs	Emp. Total
395	4	1	382
396	2,981	1,033	447
432	9,207	2,892	332
433	2,705	937	216
478	7,610	2,376	838
479	3,937	1,255	297
533	4,595	1,566	2,242
534	2,843	909	314
598	10,720	3,807	2,312
599	5,129	1,643	140
Totals	**49,731**	**16,419**	**7,520**

Table 8.2.2
New 2015 Socioeconomic Variables by TAZ

TAZ	Pop	DUs	Emp. Total
395	4	1	382
396	3,277	1,135	491
432	9,207	2,892	332
433	3,619	1,254	289
478	7,610	2,376	838
479	6,901	2,200	521
533	4,595	1,566	2,242
534	7,028	2,247	776
598	10,720	3,807	2,312

599	7,384	2,365	202
Totals	**60,345**	**19,844**	**8,385**

9.0 TRAFFIC ANALYSIS

9.1 Storage

An analysis of the storage lengths provided for left turn lanes was conducted for 99th Avenue based on projected turning volumes and existing storage lane lengths. The storage lengths required were calculated per MCDOT guidelines. Maricopa County DOT guidelines specify that the queue length is calculated per the following criteria:

Vehicles per cycle = 2 * vehicles per hour/cycles per hour
queue length = vehicles per cycle * 25 feet
with a 120 sec. cycle length, 30 cycles per hour occur
Queue Length = 2 * vehicles per hour * 25 feet/30 cycles per hour

The analysis of projected turning volume queues is shown in Table 9.1.1.

TABLE 9.1.1
Projected Volume Storage Analysis

Intersection	Aux. Lanes	PHV	# of Vehicles	Length (ft.) (Req.)	Length (ft.) (Avail.)	Comparison	Dual Left (HCM) Synchro
McDowell Rd./	NB Left	355	15	375	155	Over	191#
99th Ave.	SB Left	150	7	175	190		88#
(cycle length = 75 sec.)	EB Left	215	9	225	275		130#
	WB Left	395	17	425	240	Over	209#
Thomas Rd./	NB Left	100	2	50	235		52
99th Ave.	SB Left	280	11	275	225	Over	141#
(cycle length = 65 sec.)	EB Left	175	7	175	230		89#
	WB Left	260	10	250	200	Over	109
Indian School Rd./	NB Left	170	7	175	220		85#
99th Ave.	SB Left	235	10	250	240	Over	78
(cycle length = 65 sec.)	EB Left	60	3	75	240		35
	WB Left	265	11	275	265	Over	112#
Camelback Rd./	NB Left	175	8	200	245		80
99th Ave.	SB Left	255	11	175	245		102
(cycle length = 65 sec.)	EB Left	245	11	175	285		129#
	WB Left	285	12	300	255	Over	129#

Glendale Ave./	NB Left	195	10	250	140	Over	86
99th Ave.	SB Left	280	14	350	125	Over	137#
(cycle length = 90 sec.)	EB Left	200	10	250	140	Over	54
	WB Left	675	34	350	140	Over	343#

#95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles.
Note: Length calculated for dual left turn lanes, information provided by Synchro, Version 3.0. Analysis sheets are provided in the report appendix.

The queue lengths calculated for dual left turn lanes are based on the information provided in the 1994 Highway Capacity Manual. Additional length for deceleration of vehicles was evaluated for vehicles entering the turn lanes at 32 kmph (20 mph).

The peak hour volume analyzed in the previous table is the highest turning volume of the horizon years (2001, 2010 or 2020). The analysis of these projected turning volumes revealed that significant stacking problems are projected to exist at all section line intersections unless these intersections are reconfigured to accommodate the change in area travel patterns. The recommended geometrics for section line intersections is shown in Table 9.1.2.

TABLE 9.1.2
Design Length for Left Turn Lanes

Intersection	Auxiliary Lanes	Queue Length (ft)	Dual Turn Lanes ?	Decel* Length (ft)	Total Length (ft)
McDowell Rd./	NB Left	190	Yes	90	280
99th Avenue	SB Left	90	Yes	90	180
	EB Left	130	Yes	90	220
	WB Left	210	Yes	90	300
Thomas Rd./	NB Left	50	Yes	90	145
99th Avenue	SB Left	145	Yes	90	235
	EB Left	90	Yes	90	180
	WB Left	110	Yes	90	200
Indian School Rd./	NB Left	85	Yes	90	175
99th Avenue	SB Left	80	Yes	90	170
	EB Left	50	No	90	145
	WB Left	115	No	90	205
Camelback Rd./	NB Left	80	Yes	90	170
99th Avenue	SB Left	105	Yes	90	195
	EB Left	130	Yes	90	220
	WB Left	130	Yes	90	220
Glendale Ave./	NB Left	90	Yes	90	180
99th Avenue	SB Left	140	Yes	90	230

	EB Left	55	Yes	90	145
	WB Left	345	Yes	90	435

*90 feet required for deceleration from 32 kmph (20 mph) to stopped condition.

Based on the projected volumes and information provided in Table 9.1.2, it is recommended that dual left turn lanes (and exclusive left turn phases) be constructed at each 99th Avenue section line intersection to accommodate future turning volumes.

9.2 Intersection Traffic Volume Analysis

The future year (2001, 2010 and 2020) traffic volume projections were analyzed to evaluate the projected level of service for section line intersections on 99th Avenue and 91st Avenue. The projected levels of service are shown in Table 9.2.1. The lane geometry assumed for the 2001, 2010, and 2020 future year analyses is shown in Figures 9.2.1-3. The intersection analysis sheets are provided in the appendix.

TABLE 9.2.1
Intersection Levels of Service

Intersection	Year 2001		Year 2010		Year 2020	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
99th Ave./McDowell Rd.	B	B	B	B	C	C
99th Ave./Thomas Rd.	B	B	B	C	B	B
99th Ave./Indian School Rd.	B	B	B	B	B	B
99th Ave./Camelback Road	B	B	B	B	B	C
99th Ave./Glendale Ave.	B	B	C	C	C	C
91st Ave./McDowell Rd.	B	B	B	C	B	C
91st Ave./Thomas Rd.	B	B	B	C	B	C
91st. Ave./Indian School Rd.	B	B	B	B	C	C
91st Ave./Camelback Rd.	B	B	C	C	B	B
91st Ave./Glendale Ave.	B	B	B	B	B	C

Note: Year 2001 and 2010 - 99th Avenue and 91st Avenue analyzed as four lane roadways.

The lane configurations shown in Figures 9.2.1-3 are recommended to achieve the above levels of service.

It is advisable that provisions for future dual left turn lanes on all approaches to the McDowell Road, Thomas Road, Indian School Road, Camelback Road and Glendale Avenue intersections with 91st Avenue and 99th Avenue be incorporated into the improvements plans for 91st Avenue and 99th Avenue.

Fig 9.2.1

Fig 9.2.2

Fig 9.2.3

9.3 Roadway Link Analysis

The projected traffic volumes on roadway links within the study area were analyzed to evaluate the levels of service for 2001, 2010 and 2020 daily traffic. Roadway link level of service is generally determined by the number of and spacing of signalized intersections. However, a planning level analysis of daily volumes was conducted per MCDOT guidelines to evaluate the need for additional lanes on 99th Avenue. The projected traffic volumes were evaluated based on the MCDOT urban roadway design levels of service (LOS B) volume threshold of 45,000 vpd for a six lane principal arterial, 22,000 vpd for a four lane minor arterial and 7,000 vpd for a two lane major collector. The roadway link analysis for two-way traffic volumes is shown in Table 9.3.1. The link analysis shown in Table 9.3.1 reveals that 99th Avenue currently exceeds the design capacity between I-10 and the Agua Fria Freeway.

Upon completion of the new freeway section, 91st Avenue and 99th Avenue are projected to be below design capacity as a result of traffic volumes rerouting to the new freeway section. By year 2020, 91st Avenue, 99th Avenue, and east/west arterial roadways are projected to be above MCDOT's four lane roadway design capacity. By year 2020, 99th Avenue is anticipated to be improved to a six lane facility. Projected traffic volumes reveal that the ultimate six lane facility is not anticipated to be warranted prior to Year 2010 on 99th Avenue or 91st Avenue. An interim four lane cross-section would provide the necessary capacity to accommodate the projected daily volumes through 2010 and would be compatible with the ultimate roadway section.

The east/west roadways are shown to be currently operating below design capacity. The two lane Thomas Road links are projected to be above design capacity by year 2001; however, a programmed MCDOT/City of Phoenix project is planned to widen Thomas Road to a four lane divided roadway. All of the east/west section line roads are projected to be above design capacity in year 2020 based on traffic projections.

A level of service analysis was conducted on roadway links to evaluate the future operational conditions within the study area on roadway links above design capacity (LOS B) and is shown in Table 9.3.2.

The level of service analysis revealed the following:

- < 99th and 91st Avenues are projected to warrant widening to six lane facilities by year 2020.
- < McDowell Road, Indian School Road and Camelback Road may need reevaluation by year 2020 to determine if widening is necessary.
- < Glendale Avenue is recommended to be reevaluated in year 2005 to determine if widening to six lanes is warranted.

Table 9.3.1

Table 9.3.2

9.4 "Off Model" Roadway Link Analysis

The volumes provided by MAG were evaluated to determine if development rates complied with area development plans in the study corridor. "Off Model" traffic forecasts were conducted as previously discussed in Section 8.2. These projected volumes were compared to Year 2020 MAG projections and evaluated per MCDOT planning criteria. The projected traffic volumes and levels of service are shown in Table 9.4.1.

10.0 ALTERNATIVES

The analysis section determined that 99th Avenue will require a six lane facility by the year 2020. The location of the ultimate roadway section of 99th Avenue is influenced by the location of the SRP Irrigation Channel. The SRP Irrigation Channel, which parallels 99th Avenue on its west side, has required 99th Avenue to be offset from the section line between 5.8 and 8.2 meters (19 and 27 feet).
Three alternatives were considered as part of this study: 99th Avenue centered on the section line, 99th Avenue offset east of the section line with a two way roadway crown, and 99th Avenue offset east of the section line with a one-way roadway crown. The major design features for 99th Avenue are provided in Table 10.0.1.

TABLE 10.0.1
MAJOR DESIGN FEATURES

Standard Typical Section:	Urban Principal Arterial Road
Design Traffic Volume:	25,000 vpd (Year 2020)
Design Year:	2020
Design Vehicle:	WB-50
Design Speed:	100 km/h (60 mph)
Pavement Design Life:	20 Years
Number of Lanes:	6 Lanes
Roadway Width:	14.3m (47 ft.)
Intersection Geometrics:	10.7m (35 ft.) Min. Return Radius with curb
Drainage Structures:	N/A
Standard Right-of-way Requirements:	19.8 m (65 ft.) Typical Half-Width
Superelevation:	0.06 Maximum
Clear Zone Width:	1m (3.0 ft.) for curbed section / 9.1m (30 ft.) interim clear zone without curb
Stopping Sight Distance:	160m (525 ft.)

Other:	

insert Table 9.4.1

10.1 Alternative 1

This alternative has 99th Avenue centered on the section line. A transition is required at the southern terminus of 99th Avenue to match the existing offset roadway.

The SRP open channel, which is located approximately 4.6 meters (15 feet) west of the section line, creates additional roadway design complications and expenses. It will need to be relocated as an open channel or placed underground in an enclosed pipe. Salt River Project is the owner and will be responsible for the decision regarding the final disposition of the channel. If the channel is placed in underground pipes, it would be relocated beyond the future edge of pavement (to the west) along 99th Avenue. This relocation would be accomplished within the proposed right-of-way of 27.4 meters (90 feet) west of the section line.

This alternative will require new or widened bridge structures over the Roosevelt Irrigation District Canal, which is north of McDowell Road, and the Grand Canal at the Bethany Home Road alignment. The relocation of existing power poles, irrigation ditches and well sites will be required for this alternative. There will be an opportunity to utilize portions of the existing pavement for the northbound lanes of the roadway section.

10.1.1 Southern Terminus

South of McDowell Road, 99th Avenue is offset 5.8 meters (19 feet) east of the section line. This will require the proposed roadway section to transition from this offset to the section line over a 60:1 taper (60 mph design speed). This correlates into a 348 meter (1140 foot) taper. The taper would begin north of McDowell Road and would be completed before the 400 meter (1/4 mile) median break.

10.1.2 Northern Terminus

North of the Bethany Home Road alignment, 99th Avenue is currently centered on the section line; therefore, no transition taper from the proposed to the existing will be required.

10.1.3 Construction Management

The construction of this alternative can be accomplished with minimal disruption to the traveling public. After the relocation of the SRP Irrigation Channel and the other utilities, the new southbound lanes could be constructed and southbound traffic shifted onto the new pavement. Existing pavement would be removed for the median area and the remaining existing pavement restriped for northbound traffic.

10.2 Alternative 2

This alternative has 99th Avenue located east of the section line to avoid relocating the SRP open channel. Variations in Alternative 2 are presented for the centerline of the reconstructed ultimate roadway to be located 18.3m (60 ft.) east of the section line. A 1.6km (1 mi) section of the proposed improvements will encroach upon the SRP Irrigation Channel.

This alternative will also require new or widened bridge structures over the Roosevelt Irrigation District Canal, which is north of McDowell Road, and the Grand Canal at the Bethany Home Road alignment. The relocation of existing power poles and irrigation ditches will be required for this alternative. There will not be an opportunity to utilize any of the existing pavement in this recommended roadway section between the Bethany Home Road alignment and McDowell Road.

10.2.1 Southern Terminus

As mentioned previously, 99th Avenue is offset 5.8m (19 ft.) east of the section line at McDowell Road. A taper is required to laterally shift the roadway from the existing section at McDowell Road to the proposed ultimate section, which is 18.3m (60 ft.) east of the section line. A 60:1 taper (60 mph design speed) for the 18.3m (60 ft.) offset would require 750m (2,460 ft.) in length. It would start north of McDowell Road and would be completed before the 0.8km (0.5 mi) median break. The use of horizontal curves to transition the roadway through the offset could be utilized instead of the taper.

10.2.2 Northern Terminus

A relocation of the roadway to the west will be required to match the existing section north of the Bethany Home Road alignment. The ultimate centerline offset proposed is 18.3m (60 ft.) and will require a 1,100m (3,600 ft.) taper. Existing geometric constraints caused by the location of the US West facility north of Camelback Road require that the transition to the section line be completed south of this facility. Horizontal curves could be utilized instead of a taper to transition the roadway. It is recommended that these reverse horizontal curves transition the roadway west to the section line alignment south of Camelback Road.

10.2.3 Construction Management

The construction of this alternative can also be accomplished with minimal disruption to the 99th Avenue traffic. After the relocation of the utilities, the new northbound lanes can be constructed.
Upon the relocation of the northbound traffic to the new northbound lanes, the new southbound pavement can be constructed. This alternative will require a temporary pavement width to shift the existing southbound traffic away from the construction area for the new southbound lanes. The remaining pavement and utility removal would be accomplished after southbound traffic has been relocated to the new pavement.

10.3 Alternative 3

Alternative 3 also has a similar offset alignment to Alternative 2 for 99th Avenue. This offset alignment east of the section line will prevent relocation of the majority of the open channel that parallels 99th Avenue. Based on this alternative design, the centerline of the ultimate roadway will be located 18.3m (60 ft.) east of the section line.

Alternative 3 will also require new or widened bridge structures over the Roosevelt Irrigation District Canal north of McDowell Road and the Grand Canal. The relocation of existing power poles and irrigation ditches will be required for this alternative. In addition, this alternative will utilize portions of the existing pavement section; thus decreasing construction costs.

10.3.1 Southern Terminus

A transition is also necessary with this alternative at McDowell Road to the proposed offset section to the east. A 60:1 (60 mph design speed) taper of 750m (2,460 ft.) is required. This taper would start north of McDowell Road and would be completed before the 800m (0.5 mi) median break. Use of horizontal curves can also be utilized in place of the taper.

10.3.2 Northern Terminus

The roadway will also be required to transition from the proposed alignment to match the existing section north of Bethany Home Road. A taper of 1,100m (3,600 ft.) would be required to transition from the 18.3m (60 ft.) offset alignment to the section line alignment. Existing geometric constraints caused by the location of the US West facility north of Camelback Road require that the transition to the section line be completed south of Camelback Road. Horizontal curves can be utilized instead of an 1,100m (3,600 ft.) taper to transition back to the section line from the offset alignment.

10.3.3 Construction Management

Construction for this alternative can also be accomplished with minimal disruption to the 99th Avenue traffic. The new northbound lanes can be constructed after relocation of the adjacent utilities. After diverting all traffic through to the new northbound lanes, the southbound lanes can be modified to the proposed roadway section.

10.4 Alternative Discussion

All three alternatives will require the relocation of utilities and the construction or widening of two canal crossings. Alternative 2 will require the placement of temporary pavement to accomplish the roadway

reconstruction. Alternative 3 is a symmetrical improvement that will utilize portions of the existing pavement which will reduce construction costs for the entire project. Each alternative can be constructed with minimal impact on the traveling public and the environment.

Other than utility relocation and right-of-way acquisition, the major cost difference between the three alternatives, will be the relocation of the SRP Irrigation Channel and the extent of preservation of the existing pavement. The relocation of the channel into an underground pipe will remove a roadside hazard from the 99th Avenue Corridor. In addition, the property that has roadway frontage on 99th Avenue to the west would be more accessible for future developments.

Salt River Project allocates funds to Maricopa County and to municipal governments for aesthetic improvements to SRP irrigation facilities. The use of SRP aesthetic funds may provide a source for funding the burial of the SRP facility.

The location of the US West facility in the project corridor constrains the roadway alignment alternatives north of Camelback Road. Relocation of this facility was determined to be cost prohibitive. A single alignment alternative was evaluated north of Camelback Road that includes piping the SRP irrigation channel between Camelback Road and the Bethany Home Road alignment.

The staging of improvements can be accomplished by providing an interim four lane roadway with or without a raised center median. The section of 99th Avenue between McDowell Road and Camelback Road would be the least costly section to improve (with the offset alignment). The section of 99th Avenue between Camelback Road and Glendale Avenue would include piping one mile of the SRP irrigation channel.

11.0 RIGHT OF WAY

The project right-of-way acquisition was evaluated for each alternative alignment. The right-of-way data is summarized in Table 11.0.1. The detailed parcel acquisition is shown in tabular form in the appendix.

TABLE 11.0.1
99th Avenue Right of Way

	East of Section Line		West of Section Line		Total	
Description	Hectares	Acres	Hectares	Acres	Hectares	Acres
Alt. 1 A&B	0.9172	2.2663	8.1119	20.0501	9.0291	22.3164
Alt. 2A&3A	7.4068	18.3114	4.6937	11.5984	12.1005	29.9098

Alt. 2B&3B	6.1280	15.1423	5.4609	13.4942	11.5889	28.6365
Alt. 2C	6.1280	15.1423	N/A	N/A	6.1280	15.1423
Alt. 3C	5.3905	13.3200	N/A	N/A	5.3905	13.3200

12.0 PRELIMINARY CONSTRUCTION COSTS

12.1 Alternative 1 - Alignment Centered on the Section Line

12.1.1 Alternative 1A - Ultimate Cross Section

The first alternative (1A) was evaluated based on the reconstructed roadway being centered on the section line. The existing asphalt was assumed to be removed and the SRP Irrigation Channel tiled. The right-of-way west of the section line was estimated to be extended to 27.4m (90 ft.) to accommodate the piped channel and 19.8m (65 ft.) east of the section line between McDowell Road and the Bethany Home Road alignment. Right-of-way acquisition north of the Bethany Home Road alignment to Glendale Avenue would include 19.8m (65 ft.) east and west of the section line. Sidewalks are planned to be constructed on each side of 99th Avenue behind the back of curb. Well sites are anticipated to be relocated. The estimated cost for this alternative ($26,155,650) is shown in Table 12.1.1. The detailed calculation sheets for construction, utility and irrigation costs are contained in the Appendix. Construction costs are detailed for construction of a six lane roadway between McDowell Road and Glendale Avenue. The alignment of the six lane roadway is shown graphically in the aerial plan sheets in the appendix.

12.1.2 Alternative 1B - Interim Cross Section

The interim cross section details the cost for construction of a four lane roadway with a raised center median with the construction centerline centered on the 99th Avenue section line. The right-of-way acquisition for the interim section is the same acquisition as the ultimate section. The existing asphalt was assumed to be removed and the SRP Irrigation Channel tiled. The estimated cost for Alternative 1B ($23,258,580) is also shown in Table 12.1.1. The detailed calculation sheets for construction, utility and irrigation costs are contained in the Appendix. Construction costs are detailed for construction of a four lane roadway between McDowell Road and Glendale Avenue. The cross sections for Alternatives 1A and 1B are shown graphically in Figure 12.1.1.

12.2 Alternative 2 - Alignment Off-Set East of the Section Line (Two-Way Crown)

12.2.1 Alternative 2A - Ultimate Cross Section

Construction alternative 2A evaluated the cost based on the roadway alignment being 18.3m (60 ft.) east of the section line between McDowell Road and Camelback Road. This alternative includes the complete excavation and removal of existing asphalt, but does not require relocation of well sites or the majority of the SRP Irrigation Channel. The roadway cross section includes three northbound lanes, a raised center median, and three southbound lanes. The roadway would transition from the existing alignment north of McDowell Road to the offset distance east, extend north to Meadowbrook Avenue, then transition back to a centered section line alignment south of Camelback Road. The centered alignment would extend north to Glendale Avenue.

insert Table 12.1.1

insert Figure 12.1.1

Guardrail would be installed along the west curbline to prevent vehicles from entering the SRP irrigation channel. A 1.8m (6 ft.) sidewalk would be constructed on the east and west sides of 99th Avenue. The sidewalk on the west side of 99th Avenue would be located between the guardrail and the SRP irrigation channel. Right-of-way acquisition includes 16.8m (55 ft.) west of the section line and 38.1m (125 ft.) east of the section line between McDowell Road and Camelback Road. The right-of-way acquisition between Camelback Road and the Bethany Home Road alignment is 27.4m (90 ft.) west of the section line and 19.8m (65 ft.) east of the section line. The section between the Bethany Home Road alignment and Glendale Avenue includes acquisition of 19.8m (65 ft.) of right-of-way east and west of the section line. The preliminary cost estimate for the six lane facility ($15,205,260) is detailed in Table 12.2.1. The detailed calculation sheets for construction, utility and irrigation costs are contained in the Appendix. Construction costs are detailed for construction of a six lane roadway between McDowell Road and Glendale Avenue. The alignment of the offset six lane roadway is shown graphically in the aerial plan sheets in the appendix.

12.2.2 Alternative 2B - Modified Ultimate Cross Section

Construction alternative 2B evaluated the cost based on the roadway alignment being 15.2m (50 ft.) east of the section line between McDowell Road and Camelback Road. This alternative includes the complete excavation and removal of existing asphalt, but does not require relocation of well sites or the majority of the SRP Irrigation Channel. The roadway cross section includes three northbound lanes, a raised center median, and three southbound lanes. The roadway would transition from the existing alignment north of McDowell Road to the offset distance east, extend north to Meadowbrook Avenue, then transition back to a centered section line alignment south of Camelback Road. The centered alignment would extend north to Glendale Avenue.

Guardrail would be installed along the west curbline to prevent vehicles from entering the SRP irrigation channel. A 1.8m (6 ft.) sidewalk would be constructed on the east and west sides of 99th Avenue. The sidewalk on the west side of 99th Avenue would be located west of the SRP irrigation channel. Right-of-way acquisition includes 19.8m (65 ft.) west of the section line and 35.1m (115 ft.) east of the section line between McDowell Road and Camelback Road. The right-of-way acquisition between Camelback Road and the Bethany Home Road alignment is 27.4m (90 ft.) west of the section line and 19.8m (65 ft.) east of the section line. The section between the Bethany Home Road alignment and Glendale Avenue includes acquisition of 19.8m (65 ft.) of right-of-way east and west of the section line. The preliminary cost estimate for the six lane facility ($15,172,860) is also shown in Table 12.2.1. The detailed calculation sheets for construction, utility and irrigation costs are contained in the Appendix. Construction costs are detailed for construction of a six lane roadway between McDowell Road and Glendale Avenue.

12.2.3 Alternative 2C - Alignment with Two Way Crown - Interim Cross Section

The interim cross section details the cost for construction of a four lane roadway with the construction centerline offset 15.2m (50 ft.) east of the 99th Avenue section line. The right-of-way acquisition for the

interim section is the same acquisition as the modified ultimate section east of the section line and no acquisition west of the section line. The existing asphalt was assumed to be removed.

insert Table 12.2.1

Guardrail is planned to be installed along the SRP irrigation channel. Sidewalks are not anticipated to be constructed with the interim section. The estimated cost for Alternative 2C ($10,983,640) is also shown in Table 12.2.1. The detailed calculation sheets for construction, utility and irrigation costs are contained in the Appendix. Construction costs are detailed for construction of a five lane roadway between McDowell Road and Glendale Avenue. The cross sections for Alternatives 2A, 2B and 2C are shown graphically in Figure 12.2.1.

12.3 Alternative 3 - Alignment Off-Set East of the Section Line (One-Way crown)

12.3.1 Alternative 3A - Ultimate Cross Section

Construction alternative 3A evaluated the cost based on the roadway alignment being 18.3m (60 ft.) east of the section line between McDowell Road and Camelback Road. This alternative includes utilization of portions of the existing asphalt, but does not require relocation of well sites or the majority of the SRP Irrigation Channel. The roadway cross section includes three northbound lanes, a raised center median, and three southbound lanes. The roadway would transition from the existing alignment north of McDowell Road to the offset distance east, extend north to Meadowbrook Avenue, then transition back to a centered section line alignment south of Camelback Road. The centered alignment would extend north to Glendale Avenue.

Guardrail would be installed along the west curbline to prevent vehicles from entering the SRP irrigation channel. A 1.8m (6 ft.) sidewalk would be constructed on the east and west sides of 99th Avenue. The sidewalk on the west side of 99th Avenue would be located between the guardrail and the SRP irrigation channel. Right-of-way acquisition includes 16.8m (55 ft.) west of the section line and 38.1m (125 ft.) east of the section line between McDowell Road and Camelback Road. The right-of-way acquisition between Camelback Road and the Bethany Home Road alignment is 27.4m (90 ft.) west of the section line and 19.8m (65 ft.) east of the section line. The section between the Bethany Home Road alignment and Glendale Avenue includes acquisition of 19.8m (65 ft.) of right-of-way east and west of the section line. The preliminary cost estimate for the six lane facility ($13,337,500) is detailed in Table 12.3.1. The detailed calculation sheets for construction, utility and irrigation costs are contained in the Appendix. Construction costs are detailed for construction of a six lane roadway between McDowell Road and Glendale Avenue.

12.3.2 Alternative 3B - Modified Ultimate Cross Section

Construction alternative 3B evaluated the cost based on the roadway alignment being offset 15.2m (50 ft.) east of the section line between McDowell Road and Camelback Road. This alternative also includes the utilization of portions of the existing asphalt, but does not require relocation of well sites or the majority of the SRP Irrigation Channel. The roadway cross section includes three northbound lanes, a raised center median, and three southbound lanes. The roadway would transition from the existing alignment north of

McDowell Road to the offset distance east, extend north to Meadowbrook Avenue, then transition back to a centered section line alignment south of Camelback Road. The centered alignment would extend north to Glendale Avenue.

insert Figure 12.2.1

insert Table 12.3.1

Guardrail would be installed along the west curbline to prevent vehicles from entering the SRP irrigation channel. A 1.8m (6 ft.) sidewalk would be constructed on the east and west sides of 99th Avenue. The sidewalk on the west side of 99th Avenue would be located west of the SRP irrigation channel. Right-of-way acquisition includes 19.8m (65 ft.) west of the section line and 35.1m (115 ft.) east of the section line between McDowell Road and Camelback Road. The right-of-way acquisition between Camelback Road and the Bethany Home Road alignment is 27.4m (90 ft.) west of the section line and 19.8m (65 ft.) east of the section line. The section between the Bethany Home Road alignment and Glendale Avenue includes acquisition of 19.8m (65 ft.) of right-of-way east and west of the section line. The preliminary cost estimate for the six lane facility ($12,316,360) is also shown in Table 12.3.1. The detailed calculation sheets for construction, utility and irrigation costs are contained in the Appendix. Construction costs are detailed for construction of a six lane roadway between McDowell Road and Glendale Avenue.

12.3.3 Alternative 3C - Interim Cross Section

The interim cross section details the cost for construction of a six lane roadway with the construction centerline offset 13.7m (45 ft.) east of the 99th Avenue section line. The right-of-way acquisition for the interim section is the same acquisition as the ultimate section between Camelback Road and Glendale Avenue. The existing asphalt was assumed to be utilized. The estimated cost for Alternative 3C ($9,445,780) is also shown in Table 12.3.1. The detailed calculation sheets for construction, utility and irrigation costs are contained in the Appendix. Construction costs are detailed for construction of a six lane roadway between McDowell Road and Glendale Avenue. The cross sections for Alternatives 3A, 3B and 3C are shown graphically in Figure 12.3.1.

12.4 Cost Comparison

A summary of the cost for each alternative is provided in Table 12.4.1.

Table 12.4.1
Improvement Cost Summary

No.	Description	Alt. A	Alt. B	Alt. C
1	Centered Alignment	$26,155,650	$23,258,580	N/A
2	Offset Align. (two-way crown)	$15,205,260	$15,172,860	$10,983,640
3	Offset Align. (one-way crown)	$13,337,500	$12,316,360	$9,445,780

insert Figure 12.3.1

13.0 SUMMARY

The construction of an interim four lane divided roadway is anticipated to adequately handle the projected traffic volumes up to and beyond the year 2010. The final outside lane could be constructed as development occurs along 99th Avenue. The additional traffic volumes on 99th Avenue are anticipated to predominantly be the result of developments within the 99th Avenue corridor. The area developers will likely create a significant impact on 99th Avenue and should share in the costs for improvements to 99th Avenue.

It is recommended that the structures over the Roosevelt Irrigation District Canal and the Grand Canal be constructed to their ultimate width. This would avoid the need to add on to the structures at a later date.

Alternative 1 includes the placement of the SRP facility underground. The piping of the open irrigation channel has benefits that would be difficult to assign dollar values to. These include the safety value of the open channel being removed and the increased value of the property on the west side of 99th Avenue. Property adjacent to 99th Avenue on the west side would no longer be required to construct bridge structures over the open channel for each access point to 99th Avenue. While this alternative is more expensive, the overall benefits of a reduced safety hazard and increased benefit to the west properties is significant. This alternative minimizes additional right-of-way requirement from east side properties.

Alternative 2 is an offset alignment that includes the complete reconstruction of 99th Avenue. The offset alignment avoids the expensive relocation of the majority of the SRP irrigation channel between McDowell Road and Camelback Road. This offset alignment reduces costs associated with piping the channel by utilizing guardrail adjacent to the open channel.

Alternative 3 is also an offset alignment that has the same benefits as Alternative 2. Alternative 3 presents the potential for saved asphalt as well as the protection of existing well sites with guardrail. The available undeveloped areas adjacent to intersections with well sites creates the potential to protect well sites with guardrail and not be forced to relocate these expensive irrigation structures in Alternatives 2 and 3.

The US West facility on the east side of 99th Avenue restricts the offset roadway alignment from extending north of Camelback Road. The section of the SRP irrigation channel between Meadowbrook Avenue and the Bethany Home Road alignment is recommended to be piped to avoid the expense of impacting the US West facility. The existing well site at the 99th Avenue/Camelback Road intersection is anticipated to be protected with guardrail for Alternatives 2 and 3.

The projected traffic volumes reveal that Year 2020 volumes on 99th Avenue exceed the MCDOT design threshold volume of 22,000 vpd. Construction of a six lane Principal Arterial Roadway on 99th Avenue is anticipated to be warranted in Year 2020. The proximity to the proposed Agua Fria freeway extension provides the potential for vehicles to use 99th Avenue as an alternate route during peak hour freeway congestion. Future traffic volumes in the 99th Avenue corridor are likely to warrant dual left turn lanes at section line intersections. To provide greater flexibility to accommodate future turning volumes, it is recommended that dual left turn lanes be provided on each approach of the section line intersections.

The area residents supported the construction of a six lane facility at a public meeting held on November 19, 1997.

APPENDIX